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Technical Paper 337

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PERCEIVED WORK EFFORT AS TIME DEVOTED TO AN ACTIVITY

John R. Turney and Stanley L. Cohen

ORGANIZATIONAL EFFECTIVENESS TECHNICAL AREA

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<p>Work effort is one of the quantitative measures in organizational effectiveness programs, but little has been done to measure effort itself or its external indicators. This research explores the extent to which self-estimates of effort expended on specific activities are related to actual time spent.</p> <p>Self-estimates of the effort and amount of time spent on specific activities were collected from 31 soldiers in an information-processing facility.</p>		

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At the same time, a computer recorded the amount of time actually spent on each activity. Analysis of the data indicated that the perceptual measures of effort correlated significantly with actual durations across different activities and different measures of time. On the average, 25% of the variance in effort was accounted for by time.

External indicators of work effort can measure either intensity or duration of expended effort. When external indicators of intensity are also developed, it should be possible to determine how adequately self-estimates of effort can be anchored in external reality by incorporating measures of both intensity and duration across a range of Army jobs and organizational settings.

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John R. Turney and Stanley L. Cohen

ORGANIZATIONAL EFFECTIVENESS TECHNICAL AREA

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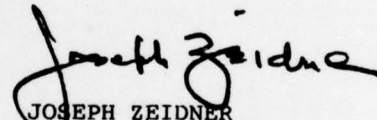
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Organizational Effectiveness

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FOREWORD

Research of the Organizational Effectiveness Technical Area of the Army Research Institute for the Behavioral and Social Sciences (ARI) has helped provide the foundation for the Army's present programs in organizational effectiveness (OE). ARI Technical Papers 272 and 275 described the development and validation of the Work Environment Questionnaire (WEQ), used to identify OE problem areas. This Technical Paper reports an investigation of a method of measuring work effort--one of the criteria in OE programs--by correlating self-estimates of effort with actual time spent in specific activities. Technology base research in OE, of which this investigation is a part, is conducted under Army Project 2Q162717A779, Techniques for Organizational Effectiveness and Management Training, FY 78 Work Program.


JOSEPH ZEIDNER
Technical Director

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PERCEIVED WORK EFFORT AS TIME DEVOTED TO AN ACTIVITY

BRIEF

Requirement:

Work effort functions as either an implicit or explicit standard of measurement in theories of work motivation and in organizational effectiveness programs. However, little evidence is available on how adequately the perceptual measures that are assumed to tap this variable actually perform. Although a self-estimate may represent the most direct measure of internally generated exertion, no attempt has been made to relate this variable to external indicators with which it should covary. This research investigated the relationship between perceived effort and one such external indicator, the duration of behavior.

Procedure:

Perceptual measures of self-estimated effort devoted to specific work activities were collected in an Army field installation. They were related to measures of duration defined as time devoted to each activity. Time was measured by means of self-estimates and behavioral indexes collected over a 6-week interval. These data were analyzed in a multi-activity-multimethod correlation matrix.

Findings:

The perceptual measure of effort was found to correlate significantly with duration across different activities and different measures of time. On the average, time accounted for 25% of the variance in effort.

Utilization of Findings:

It is still necessary to develop other external indicators of exerted effort dealing with intensity. Then by incorporating both measures of intensity and duration across a range of Army jobs and organizational settings, it should be possible to determine how adequately self-estimates of effort can be anchored in external reality.

Valid measures of effort that focus on specific activities serve several functions in Army organizations. They can be used to develop effort activity profiles for soldiers, to determine the activities on which personnel are expending most effort. Such activities may not contribute to optimal productivity; therefore change may be needed to

develop programs designed to restructure the way personnel distribute their effort. Measures of effort expenditure can also provide sensitive, direct data for the evaluation of the impact of programs designed to improve soldier job motivation. Finally, job training programs can be evaluated in terms of the extent to which trainee distribution of work effort among tasks fulfills the requirements of formal operating procedures.

PERCEIVED WORK EFFORT AS TIME DEVOTED TO AN ACTIVITY

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PERCEIVED WORK EFFORT AS TIME DEVOTED TO AN ACTIVITY

INTRODUCTION

Work effort is a construct that underlies a substantial volume of theory and research in organizational/industrial psychology. In any theory of work motivation or in the conduct of any organizational development program designed to improve employee job satisfaction and performance, we are, at least implicitly, dealing with the work effort construct. The work effort construct serves as an implicit or explicit criterion in most theoretical and applied research formulations in the area of motivation; it therefore seems appropriate to devote attention to the development and validation of measures of this construct. In actuality, little research effort has thus far been expended in examining measures of the construct itself. This study describes an initial attempt to address this need by focusing on self-estimates of effort expended and exploring the extent to which actual time spent performing specific work activities is related to perceived effort devoted to these activities.

Literature Review

The recent proliferation of studies operationalizing and testing various path-goal expectancy conceptualizations emphasizes the lack of attention paid to the measurement of work effort in much of the theoretical work on motivation. (This deficiency has been noted in reviews by Mitchell, 1971; House, Shapiro, & Wahba, 1974; Mitchell, 1974.) In most of these studies, complex multivariate operations of the theoretical model are developed to tap the level of motivational force that exists for a worker. However, the measure of how this force is discharged, which is used to test the expectancy model, generally consists of single variables of uncertain validity and reliability. In an examination of 31 expectancy theory studies, 15 were found to use only measures of performance or output as criteria. Although these criteria do contain the "effort" component, they are likely to be influenced by various situational, task, and ability factors. Sixteen studies incorporated some measure of work effort as a criterion. However, there was no evidence of the reliability or validity of these measures beyond a few attempts to compare self-estimates and others' estimates of effort (e.g., Porter & Lawler, 1968; Lawler & Suttle, 1973). It is interesting to note that in studies conducted by Mitchell and Albright (1972), Turney (1974), and Porter and Lawler (1968), wherein both measures of effort and performance were utilized, the effort criteria yielded much stronger relationships with the expectancy theory variables.

A similar lack of criterion specificity is found in the theoretical work of Herzberg (1966), whose model of work motivation has served as the foundation for many applied job enrichment programs. Herzberg assumes that factors such as job responsibility and job autonomy influence an

employee's level of job satisfaction and motivation and, in turn, ultimately determine the amount of work effort expended. Therefore, job enrichment programs focusing on these factors to make a job more satisfying and intrinsically motivating should, in turn, positively affect the employee's work effort. However, close examination of Herzberg's work does not reveal any discussion of criteria of work effort that he would use to determine the impact of changes in any satisfiers and motivators. In reviews of job enrichment studies by Maher (1971), Ford (1969), and Paul, Robertson, and Herzberg (1969), we found no references to any research in which work effort exerted by participants was a criterion measure of a job enrichment program. A measure of work effort that taps the actual expression of motivation seems to be a more appropriate criterion than the attitude or performance measures utilized in these studies.

One reason for omitting work effort as a criterion is the absence of measures of the actual expenditure of work effort. There are a number of scales available that are intended to measure the motivation to work--for example, those developed by Landy and Guion (1970) and Kahoe (1974). However, the focus in these measures is on the predisposition to exert effort rather than actual effort expenditure. For example, two dimensions included in the Landy and Guion scales are task concentration and persistence. Both are defined as the tendency to work, over time, and are measured in terms of behavioral descriptions of this tendency. We are interested here in the actual effort expended rather than in the more general description conveyed by data based on predispositions or tendencies. Such specific information on actual effort is necessary for developing the criterion information required in evaluation of models (e.g., expectancy theory) and applied implementation programs (e.g., job enrichment), for which one must isolate the effects of motivation.

Measuring Effort

Effort can be viewed as the product of an individual's internal motivation, which in turn derives from various need deprivations or goal aspirations. It can be influenced by factors in the external environment, such as a supervisor who either encourages a worker to exert greater effort in productive tasks or imposes job structure that focuses the expenditure of effort on specific activities. Expressed in terms of Lewin's (1951) field theory approach, effort can be viewed as the result of a field of forces generated by these internal and external factors. These forces drive and direct behavior, and an individual exerts effort performing those specific activities perceived by this individual as most likely to lead to need reduction or goal attainment.

The most direct source of information on actual effort exerted would be the individual worker himself, because effort is internally generated. Moreover, as shown by Mitchell and Albright (1972) and Williams and Seiler (1973), observers who must rely on external cues are unlikely to discriminate between effort exerted and job performance, which mixes effort with ability. However, workers' own perceptions of the effort they have

exerted may be a function of various combinations of factors that they take into account in arriving at their effort estimates. These combinations may result in possible response biases that reduce the comparability of workers' effort estimates among themselves or against some standard. One approach to this problem is to attempt to relate effort estimates to external, objective measures of variables, which should covary with work effort. Following this procedure, it should be possible to determine empirically the amount of variance in effort estimates that is solely a function of unique individual biases and the amount accounted for by standardized, objective factors. This study initiates this exploration by focusing on one relationship between an external variable and self-estimates of effort expended.

External indicators of how much effort an individual exerts performing a given activity can be viewed as falling into two general categories, intensity and duration. Intensity refers to how much force an individual puts into the activity at any one time; duration refers to the total force devoted to the activity over an extended period of time. Therefore, total effort expended performing an activity should be a function of some combination of these two variables. In this study, our interest was to examine the extent of the relationship between perceived effort expended and selected measures of duration. Intensity was left for later research, because extensive initial groundwork is required to explore possible unobtrusive measures of this variable (e.g., muscle tension and eye contact).

As noted earlier, our interest is in actual effort expended rather than intended effort or global estimates of tendencies described as task concentration or persistence. Therefore, we selected as our measure of duration the actual time which an individual worker devoted to various activities. We also examined a number of different activities to determine whether duration was more strongly related to perceived effort expended for some activities than for others.

METHOD

Participants

Enlisted U.S. Army personnel assigned to an information-processing facility served in this study. All 31 participants in the study performed the same job duties.

Measures

The activities that the workers performed had been differentiated by internal organizational staff personnel into five discrete behavioral dimensions. Three of these activities were selected for focus in this study. One of the unselected activities was eliminated because it was performed infrequently, and the other was omitted because interviews with the workers themselves indicated various interpretations of the nature of

this activity. The three activities utilized in this study consisted of searching for certain information with the aid of sophisticated electronic equipment, copying key parts of the information, and taking work breaks.

The respondents were requested to complete the following scales for each of the three activities. They were asked to think of an average workday in formulating their responses.

1. Effort. A measure directly addressing work effort as follows:

The amount of work effort you personally put out performing this activity in a workday.

7	6	5	4	3	2	1
Extreme			Some			No
High Effort			Effort			Effort

2. Time. A measure of the time devoted to each activity expressed as:

The amount of time you actually spend performing this activity in a workday.

7	6	5	4	3	2	1
Very			Some			No
Much Time			Time			Time

3. Amount of Time. A measure developed by Bass, Cascio, and O'Connor (1974) with adjectives describing statistically determined increasing amounts along a 7-point scale with each point anchored. The seven descriptions in ascending degrees of amount are none of my time, somewhat of my time, a moderate amount of time, quite a bit of time, a great amount of time, an extraordinary amount of time, and all of my time. This measure was included as an alternative measure of time devoted to an activity.

A separate, more direct measure of time devoted to each activity was based on the computer-monitored time that a worker devoted to each activity. The worker was required to make a predetermined input on a teletype at his work station; this input indicated to the computer that he was performing a specific activity. The computer kept track of the time the worker devoted to that activity until a new input indicated a change to another activity. Data on total time spent performing each of the activities examined in this study were collected for a full 7 weeks prior to the administration of the questionnaire measures. This time interval was selected because of fluctuations in the work cycle, which reduced the reliability of data based on shorter periods of time. The percent of worktime devoted to each of the three activities, which was used for the analyses in this study, will be referred to as monitored time.

RESULTS

To explore the relationships between effort and time devoted to content-specific activities, we drew upon Campbell's and Fiske's (1959) approach to construct validation and structured our correlational data in the form of a multiactivity-multimethod matrix. Our initial interest in examining this matrix, presented in Table 1, was whether or not the perceived effort measure itself differentiated the effort exerted performing each of the three focal work activities. The three correlations in the lower right triangle of the matrix show that there were no significant relationships in effort expended, when one activity is correlated against another. Perceived effort exerted searching correlated .24 with effort exerted copying and -.15 with effort spent taking breaks. Effort spent copying correlated -.06 with work break effort.

The triangles off the main diagonal of the matrix deal with how well the three time measures discriminate among activities. Only the correlations between search time and copy time show any overlap with significant correlations of .41 for Time and .30 for Amount Time. Monitored Time showed a significant negative correlation between these same two activities of -.36, indicating that one of these activities may supplant the other.

We also find that our three measures of time show fairly consistent relationships with each other. Time and Amount Time yield significant, higher correlations when measuring the same activity than when measuring different activities as shown in the matrix. The diagonal correlations representing the relationship between the two measures for each activity taken in turn show positive correlations of .79, .83, and .47, all significant at $p < .01$. Correlations involving comparisons of two different activities are insignificant with the exception of the correlation between search time and copy time of .36, which is significant at $p < .05$. Time and Monitored Time show the same consistent pattern. The diagonal correlations are all significant and positive with values of .32, .40, and .37 for the three activities, respectively, whereas no off-diagonal correlations attain statistical significance. In comparing the Monitored Time and Amount measures we find a significant positive correlation of .35 for these two measures when they both focus on searching. However, neither correlation reaches significance when the other two activities are the focus. Therefore, perceived time holds up more consistently across activities in comparisons with the computer-monitored measure of time than does perceived amount of time.

Taken together, these data provide support for the discriminant validity of the Perceived Time and Monitored Time measures through their ability to differentiate among activities and for their convergent validity in terms of their significant relationships when measuring the same activity. Slightly less support is found for the convergent validity of Amount Time, because it yields consistent relationships across activities in comparisons with Time; but only one of the three correlations is significant in comparisons involving Monitored Time.

Table 1

Multiactivity-Multimethod Effort Matrix

Measure	Activity	Time			Amount			Monitor			Effort		
		ST	CT	WT	SA	CA	WA	SM	CM	WM	SE	CE	WE
Time	Search (ST)												
	Copy (CT)	.41**											
	Work breaks (WT)	.03	.24										
Amount Time	Search (SA)	.79***	.36*	-.25									
	Copy (CA)	.27	.83***	.27	.50*								
	Work breaks (WA)	.01	-.12	.47**	-.07	.03							
Monitored Time	Search (SM)	.32*	.00	-.09	.35*	-.01	-.02						
	Copy (CM)	-.01	.40**	-.08	-.11	.16	-.31*	-.36*					
	Work breaks (WM)	-.21	-.14	.37*	-.25	-.08	-.20	.11	-.34*				
Effort	Search (SE)	.81***	.34*	-.27	-.82***	.20	-.25	.32*	.01	.02			
	Copy (CE)	.06	.44***	-.05	.27	.47***	-.01	-.02	.37*	-.22	.24		
	Work breaks (WE)	.02	.27	.84***	-.22	.24	.35*	-.37*	-.32*	.29 ^o	-.15	-.06	

n = 31

*p < .05

**p < .01

***p < .001

^op < .06

Turning now to the examination of the relationships between effort and time spent performing the focal activities, we refer to the lowest rows of the matrix. The correlations between time and effort are shown in each diagonal. There are significant positive correlations between time and effort for eight of the nine diagonal coefficients. The ninth, involving work break monitored time, demonstrates borderline significance ($p < .06$). The range of the correlations across the three activities runs from .84 to .29, with the median at .44. In all cases, these correlations are stronger than the off-diagonal correlations involving comparisons between two different activities.

The computer-monitored time measure yielded the lowest but most consistent correlations with effort across the three activities with two significant correlations of .32 and .37 and one of borderline significance. The two perceptual measures of time yielded stronger correlations but were less consistent across activities. Both perceived time and amount of time showed similar high correlations with effort, of .81 and .82, respectively, for the search activity, and similar correlations (half this magnitude) of .44 and .47 for the copy activity. Finally, perceived time had a correlation of .84 with effort for the work break activity, whereas perceived amount of time correlated .35 with effort for this same activity. Taken together, these data demonstrate significant relationships between effort and time devoted to specific work activities, although the strength of the relationship varies between activities and measures of time.

DISCUSSION

Although the data demonstrate that the effort a worker expends performing specific activities is related to the time he devotes to each activity, there is considerable variation in the strength of the relationship as a function of the measure of time utilized and the activity focused on. The time measure showing the most consistent relationships across activities is the computer-monitored measure. As this measure was based on actual accumulations of time devoted to each activity over a 7-week interval, it was more firmly anchored to workers' actual behavior than either of the two perceptual estimates of time. The fact that effort was measured at one point in time following the 7-week interval may have served to attenuate this time-effort relationship to some extent. A more consistent approach might have been to obtain estimates of effort throughout the 7-week interval for each activity and calculate a composite or average across these data points. However, the fact that two of the three activity correlations using only one data point for perceived effort and a 7-week, behaviorally based time interval were significant provides strong evidence for the presence of a measurable time-effort linkage.

Although the monitored time measure yielded relatively consistent correlations with effort across all three activities, and two perceptual measures varied as a function of the focal activity. Both demonstrated consistent time-effort correlations for the search and copy activities.

If we examine the pattern of correlations for all three activities, we find that the copy time activity demonstrated the most consistent pattern of time-effort correlations across all three measures. The search time activity showed the greatest discrepancy between the perceptual measures and monitored time. Some of these discrepancies may be resolved in future research if data are collected for both time and effort over an extended period of time, to increase reliability in both measures and to determine systematic variance in effort as a function of changes in time devoted to a given activity. For example, does reduced time devoted to an activity result in perceptions of proportionate reduction in effort?

Although there are discrepancies among the measures for different activities in the exact amount of variance in effort that is accounted for by time, a significant time-effort relationship has been clearly demonstrated. Averaging all of the time-effort correlations across activities, we find that approximately 25% of the variance in effort is accounted for by time (11% if only the monitored time-effort correlations are considered). Future research must examine measures of intensity as well as duration, to determine how much total variance in effort can be accounted for by variables external to the individual worker. By this procedure, we can see how adequately we can anchor self-estimates of effort in external reality. Such information is critical if we are to rely on effort as a primary quantitative criterion to evaluate organizational psychology theory and application.

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 1 USA Armor Sch, Ft Knox, ATTN: ATSB-CD-AD
 2 HQUSACDEC, Ft Ord, ATTN: Library
 1 HQUSACDEC, Ft Ord, ATTN: ATEC-EX-E-Hum Factors
 2 USAEEC, Ft Benjamin Harrison, ATTN: Library
 1 USAPACDC, Ft Benjamin Harrison, ATTN: ATCP-HR
 1 USA Comm-Elect Sch, Ft Monmouth, ATTN: ATSN-EA
 1 USAEC, Ft Monmouth, ATTN: AMSEL-CT-HDP
 1 USAEC, Ft Monmouth, ATTN: AMSEL-PA-P
 1 USAEC, Ft Monmouth, ATTN: AMSEL-SI-CB
 1 USAEC, Ft Monmouth, ATTN: C, Fac Dev Br
 1 USA Materials Sys Anal Agcy, Aberdeen, ATTN: AMXSY-P
 1 Edgewood Arsenal, Aberdeen, ATTN: SAREA-BL-H
 1 USA Ord Ctr & Sch, Aberdeen, ATTN: ATSL-TEM-C
 2 USA Hum Engr Lab, Aberdeen, ATTN: Library/Dir
 1 USA Combat Arms Tng Bd, Ft Benning, ATTN: Ad Supervisor
 1 USA Infantry Hum Rsch Unit, Ft Benning, ATTN: Chief
 1 USA Infantry Bd, Ft Benning, ATTN: STEBC-TE-T
 1 USASMA, Ft Bliss, ATTN: ATSS-LRC
 1 USA Air Def Sch, Ft Bliss, ATTN: ATSA-CTD-ME
 1 USA Air Def Sch, Ft Bliss, ATTN: Tech Lib
 1 USA Air Def Bd, Ft Bliss, ATTN: FILES
 1 USA Air Def Bd, Ft Bliss, ATTN: STEBD-PO
 1 USA Cmd & General Stf College, Ft Leavenworth, ATTN: Lib
 1 USA Cmd & General Stf College, Ft Leavenworth, ATTN: ATSW-SE-L
 1 USA Cmd & General Stf College, Ft Leavenworth, ATTN: Ed Advisor
 1 USA Combined Arms Cmbt Dev Act, Ft Leavenworth, ATTN: DepCdr
 1 USA Combined Arms Cmbt Dev Act, Ft Leavenworth, ATTN: CCS
 1 USA Combined Arms Cmbt Dev Act, Ft Leavenworth, ATTN: ATCASA
 1 USA Combined Arms Cmbt Dev Act, Ft Leavenworth, ATTN: ATCACO-E
 1 USA Combined Arms Cmbt Dev Act, Ft Leavenworth, ATTN: ATCACO-CI
 1 USAECOM, Night Vision Lab, Ft Belvoir, ATTN: AMSEL-NV-SD
 3 USA Computer Sys Cmd, Ft Belvoir, ATTN: Tech Library
 1 USAMERDOC, Ft Belvoir, ATTN: STSFB-DQ
 1 USA Eng Sch, Ft Belvoir, ATTN: Library
 1 USA Topographic Lab, Ft Belvoir, ATTN: ETL-TD-S
 1 USA Topographic Lab, Ft Belvoir, ATTN: STINFO Center
 1 USA Topographic Lab, Ft Belvoir, ATTN: ETL-GSL
 1 USA Intelligence Ctr & Sch, Ft Huachuca, ATTN: CTD-MS
 1 USA Intelligence Ctr & Sch, Ft Huachuca, ATTN: ATS-CTD-MS
 1 USA Intelligence Ctr & Sch, Ft Huachuca, ATTN: ATSI-TE
 1 USA Intelligence Ctr & Sch, Ft Huachuca, ATTN: ATSI-TEX-GS
 1 USA Intelligence Ctr & Sch, Ft Huachuca, ATTN: ATSI-CTS-OR
 1 USA Intelligence Ctr & Sch, Ft Huachuca, ATTN: ATSI-CTD-DT
 1 USA Intelligence Ctr & Sch, Ft Huachuca, ATTN: ATSI-CTD-CS
 1 USA Intelligence Ctr & Sch, Ft Huachuca, ATTN: DAS/SRD
 1 USA Intelligence Ctr & Sch, Ft Huachuca, ATTN: ATSI-TEM
 1 USA Intelligence Ctr & Sch, Ft Huachuca, ATTN: Library
 1 CDR, HQ Ft Huachuca, ATTN: Tech Ref Div
 2 CDR, USA Electronic Prog Grd, ATTN: STEEP-MT-S
 1 CDR, Project MASSTER, ATTN: Tech Info Center
 1 Hq MASSTER, USATRADOC, LNO
 1 Research Institute, HQ MASSTER, Ft Hood
 1 USA Recruiting Cmd, Ft Sheridan, ATTN: USARCPM-P
 1 Senior Army Adv., USAFAGOD/TAC, Elgin AF Aux Fld No. 9
 1 HQ USARPAC, DCSPER, APO SF 96558, ATTN: GPPE-SE
 1 Stimson Lib, Academy of Health Sciences, Ft Sam Houston
 1 Marine Corps Inst., ATTN: Dean-MCI
 1 HQUSMC, Commandant, ATTN: Code MTMT-51
 1 HQUSMC, Commandant, ATTN: Code MPI-20
 2 USCG Academy, New London, ATTN: Admission
 2 USCG Academy, New London, ATTN: Library
 1 USCG Training Ctr, NY, ATTN: CO
 1 USCG Training Ctr, NY, ATTN: Educ Svc Ofc
 1 USCG, Psychol Res Br, DC, ATTN: GP 1/62
 1 HQ Mid-Range Br, MC Det, Quantico, ATTN: P&S Div

1 US Marine Corps Liaison Ofc, AMC, Alexandria, ATTN: AMCGS-F
 1 USATRADO, Ft Monroe, ATTN: ATRO-ED
 6 USATRADO, Ft Monroe, ATTN: ATPR-AD
 1 USATRADO, Ft Monroe, ATTN: ATTS-EA
 1 USA Forces Cmd, Ft McPherson, ATTN: Library
 2 USA Aviation Test Bd, Ft Rucker, ATTN: STEBG-PO
 1 USA Agcy for Aviation Safety, Ft Rucker, ATTN: Library
 1 USA Agcy for Aviation Safety, Ft Rucker, ATTN: Educ Advisor
 1 USA Aviation Sch, Ft Rucker, ATTN: PO Drawer O
 1 HQUSA Aviation Sys Cmd, St Louis, ATTN: AMSAV-ZDR
 2 USA Aviation Sys Test Act., Edwards AFB, ATTN: SAVTE-T
 1 USA Air Def Sch, Ft Bliss, ATTN: ATSA TEM
 1 USA Air Mobility Rsch & Dev Lab, Moffett Fld, ATTN: SAVDL-AS
 1 USA Aviation Sch, Res Tng Mgt, Ft Rucker, ATTN: ATST-T-RTM
 1 USA Aviation Sch, CO, Ft Rucker, ATTN: ATST-D-A
 1 HQ, DARCOM, Alexandria, ATTN: AMXCD-TL
 1 HQ, DARCOM, Alexandria, ATTN: CDR
 1 US Military Academy, West Point, ATTN: Serials Unit
 1 US Military Academy, West Point, ATTN: Ofc of Milt Ldrshp
 1 US Military Academy, West Point, ATTN: MAOR
 1 USA Standardization Gp, UK, FPO NY, ATTN: MASE-GC
 1 Ofc of Naval Rsch, Arlington, ATTN: Code 452
 3 Ofc of Naval Rsch, Arlington, ATTN: Code 458
 1 Ofc of Naval Rsch, Arlington, ATTN: Code 450
 1 Ofc of Naval Rsch, Arlington, ATTN: Code 441
 1 Naval Aerosp Med Res Lab, Pensacola, ATTN: Acous Sch Div
 1 Naval Aerosp Med Res Lab, Pensacola, ATTN: Code L51
 1 Naval Aerosp Med Res Lab, Pensacola, ATTN: Code L5
 1 Chief of NavPers, ATTN: Pers-OR
 1 NAVAIRSTA, Norfolk, ATTN: Safety Ctr
 1 Nav Oceanographic, DC, ATTN: Code 6251, Charts & Tech
 1 Center of Naval Anal, ATTN: Doc Ctr
 1 NavAirSysCom, ATTN: AIR-5313C
 1 Nav BuMed, ATTN: 713
 1 NavHelicopterSubSqua 2, FPO SF 96601
 1 AFHRL (FT) William AFB
 1 AFHRL (TT) Lowry AFB
 1 AFHRL (AS) WPAFB, OH
 2 AFHRL (DOJZ) Brooks AFB
 1 AFHRL (DOJN) Lackland AFB
 1 HQUSAF (INYSO)
 1 HQUSAF (DPXXA)
 1 AFVTG (RD) Randolph AFB
 3 AMRL (HE) WPAFB, OH
 2 AF Inst of Tech, WPAFB, OH, ATTN: ENE/SL
 1 ATC (XPTD) Randolph AFB
 1 USAF AeroMed Lib, Brooks AFB (SUL-4), ATTN: DOC SEC
 1 AFOSR (NL), Arlington
 1 AF Log Cmd, McClellan AFB, ATTN: ALC/DPCRB
 1 Air Force Academy, CO, ATTN: Dept of Bel Sen
 6 NavPers & Dev Ctr, San Diego
 2 Navy Med Neuropsychiatric Rsch Unit, San Diego
 1 Nav Electronic Lab, San Diego, ATTN: Res Lab
 1 Nav TngCen, San Diego, ATTN: Code 9000-Lib
 1 NavPostGraSch, Monterey, ATTN: Code 55Aa
 1 NavPostGraSch, Monterey, ATTN: Code 2124
 1 NavTngEquipCtr, Orlando, ATTN: Tech Lib
 1 US Dept of Labor, DC, ATTN: Manpower Admin
 1 US Dept of Justice, DC, ATTN: Drug Enforce Admin
 1 Nat Bur of Standards, DC, ATTN: Computer Info Section
 1 Nat Clearing House for MH-Info, Rockville
 1 Denver Federal Ctr, Lakewood, ATTN: BLM
 12 Defense Documentation Center
 4 Dir Psych, Army Hq, Russell Ofcs, Canberra
 1 Scientific Adesr, Mil Bd, Army Hq, Russell Ofcs, Canberra
 1 Mil and Air Attache, Austrian Embassy
 1 Centre de Recherche Des Facteurs Humaine de la Defense Nationale, Brussels
 2 Canadian Joint Staff Washington
 1 C/An Staff, Royal Canadian AF, ATTN: Pers Std Anal Br
 3 Chief, Canadian Def Rsch Staff, ATTN: C/CRDS(W)
 4 British Def Staff, British Embassy, Washington
 1 Def & Civil Inst of Enviro Medicine, Canada
 1 AIR CRESS, Kensington, ATTN: Info Sys Br
 1 Militaerpsychologisk Tjeneste, Copenhagen
 1 Military Attache, French Embassy, ATTN: Doc Sec
 1 Medecin Chef, C.E.R.P.A.-Arsenal, Toulon/Naval France
 1 Prin Scientific Off, Appl Hum Engr Rsch Div, Ministry of Defense, New Delhi
 1 Pers Rsch Ofc Library, AKA, Israel Defense Forces
 1 Ministeris van Defensie, DOOP/KL Afd Sociaal Psychologische Zaken, The Hague, Netherlands